Engineering Management
Field Project

Case Study: Ethernet Cell Site Backhaul Request for Quotation Process

By

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Spring Semester, 2012

An EMGT Field Project report submitted to the Engineering Management Program
and the Faculty of the Graduate School of The University of Kansas
in partial fulfillment of the requirements for the degree of
Master's of Science

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Acknowledgements

I would like to thank my committee members Herb Tuttle, Marc Richardson, and Joseph Rouphael for lending their valuable time and guidance towards the completion of this project. Their constructive comments and feedback were very important in the success of this paper. I am very grateful for their assistance.

I would also like to thank Lisa Johnson for her efforts in reviewing and providing feedback for this project.

Finally, I would like to thank my family for their understanding, encouragement, and support in the completion of this project.

Acronyms/Definitions

Acronym	Definition
2/2.5 G	Second Generation
3G	Third Generation
4G	Fourth Generation
AAVs	Alternative Access Vendors
Bcc	Blind Carbon Copy
CLECs	Competitive Local Exchange Carriers
CLLI	Common Language Location Identifier
iLECs	Incumbent Location Exchange Carriers
IP	Internet Protocol
LAN	Local Area Network
LATA	Local Access and Transport Area
LTE	Long Term Evolution
MB	Megabyte
Mb	Megabit
Mbps	Megabits per second
MSC	Mobile Switching Center
MSOs	Multiple System Operators
MTA/BTA	Major Trading Area/Basics Trading Area
NDA	Non-Disclosure Agreement
RACI	Responsible Accountable Consulted Informed
RBOC	Regional Bell Operating Company
RF	Radio Frequency
RFQ	Request for Quotation
SDH	Synchronous Digital Hierarchy
SLA	Service Level Agreement
SONET	Synchronous Optical Networking
TDM	Time Division Multiplexing

Executive Summary

The use of wireless smart devices is growing rapidly and the average user requires more bandwidth than ever. The combination of these two issues places a heavy burden on the wireless operators' ability to support their customers. To resolve this challenge, the wireless operators are launching the fourth generation (4G) Long-Term Evolution (LTE) mobile network. However, the current backhaul network on Time Division Multiplexing (TDM) T1s does not have the scalability, flexibility, or cost effectiveness to support 4G LTE. Ethernet backhaul, on the other hand, possesses all three of these features, which allows it to support 4G LTE. Though it has many benefits, Ethernet backhaul does have some drawbacks; it does not have an established pricing structure and lacks universal technical standardization. Because of these unknown factors, wireless operators are at risk.

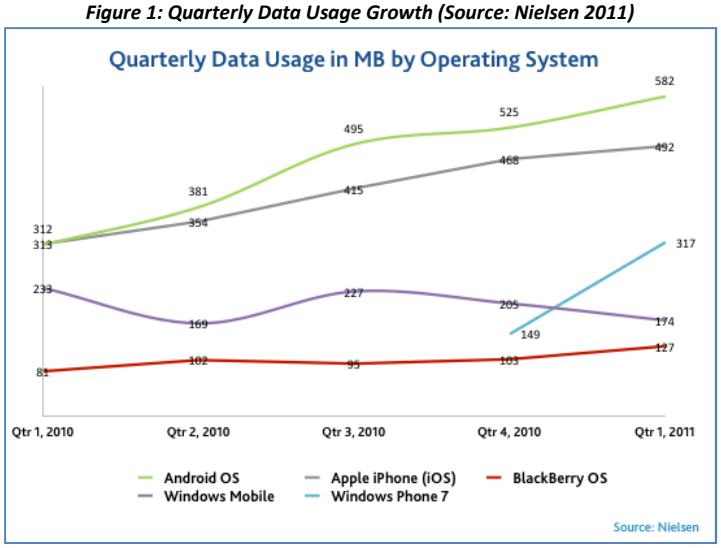
By issuing a Request for Quotation (RFQ), the wireless operators will be able to address pricing and standardization concerns of Ethernet backhaul. Through careful evaluation, results from the RFQ will help the wireless operators select the Ethernet backhaul solutions with the right pricing structure from the access providers.

Chapter 1 - Introduction

When Apple announced the availability of the iPhone 4S on October 14, 2011, Apple sold more than four million units within the first three days (Yin, 2011). This more than doubles the 1.7 million iPhone 4 sold in a three day span in June 2010. In a demonstration of similar explosive growth, according to Cellular Telecommunications Industry Association (CTIA), there were 38.2 million wireless subscriber connections in June of 1996 (CTIA, 2011). This number jumped to 322.9 million in June of 2011 (CTIA), almost a ten-fold increase. The popularity of the iPhone, taken in consideration with the enormous increase in subscribers, illustrates the high demand consumers have for wireless smart devices and reflects an overall growth in the telecommunications industry.

In addition to growing number of wireless subscribers, the individual user is consuming more bandwidth than ever. A senior manager of Telecom Research and Insights group at Nielsen, Don Kellogg writes, "in just the last 12 months, the amount of data the average smart phone user consumes per month has grown by 89 percent from 230 Megabytes (MB) in Q1 2010 to 435 MB in Q1 2011" (2011). iPhones and Android devices are leading the way in this data consumption. Figure 1 below shows the quarterly data usage from first quarter 2010 to first quarter 2011.

Figure 1: Quarterly Data Usage Growth (Source: Nielsen 2011)



Considering both the subscriber connection growth in addition to their increased bandwidth usage, it has become difficult for wireless operators to ensure their networks are able to support the customers' demand. The backhaul network in particular will need to be engineered appropriately in order to sustain and adapt to the growing traffic.

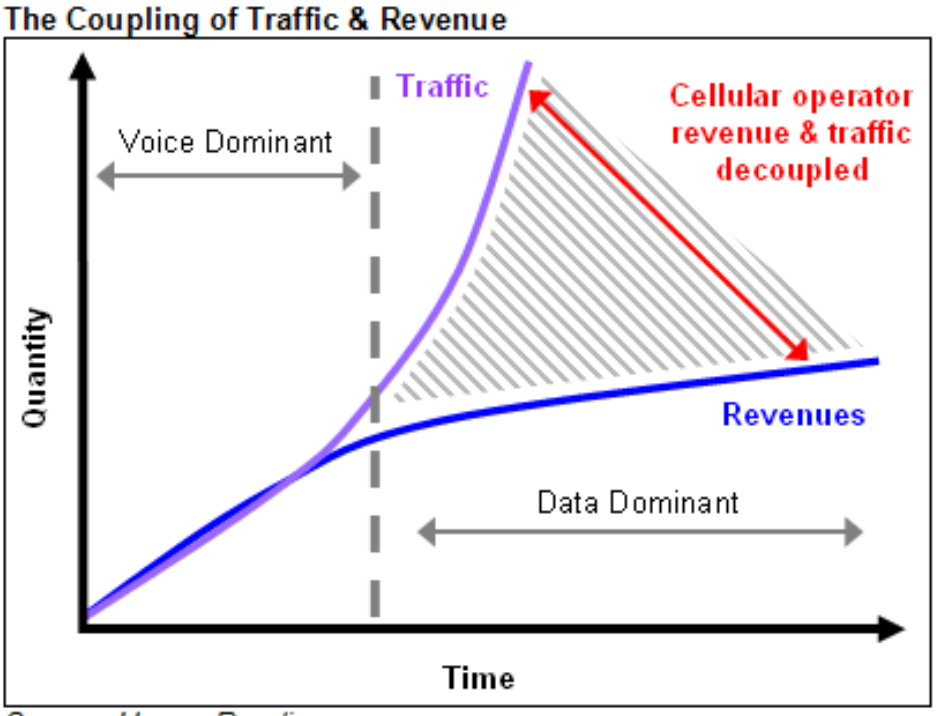
The backhaul network is the connection between the cell towers to the wireless operator Mobile Switching Center (MSC) to the core network and final connection destination. In the current second and third generation networks (2G/3G), cell site backhaul connections use Time Division Multiplexing (TDM) technology. These connections are generally dedicated copper facilities call T1s. Each T1 is capable of 1.544 Mbps (Megabits per second) data rate. On average, a cell tower has three T1s for backhaul to support the current 2G/3G networks. This capacity will soon be insufficient to support the current subscriber growth, demands for increased traffic, and current fourth generation (4G) networks.

Long Term Evolution (LTE) has emerged as the preferred 4G technology to replace 2G/3G in the telecommunications industry. According to recent advertisements, AT&T claims that LTE is ten times faster than the current 2G/3G networks. In order for this to be true, the

backhaul capacity needed for LTE must also be ten times more than the average three T1s. Co-founder and Principal Analyst of Infonetics Research, Michael Howard says, "In the early LTE rollouts that started in 2010, carriers are deploying 50Mbps to 100Mbps cell site backhaul speeds per mobile operator" (2011). Based on this, a LTE tower will need a minimum of 50 Mbps or about 33 T1s for backhaul. Unless you own the backhaul, the cost of a T1 is "upwards of $300 or $400 a month" (Breznick, 2009). At $300 per T1 per month for 33 T1s, a tower on LTE will cost $9,900 per month. At this price, the backhaul on T1s for LTE is not financially feasible. Conversely, at the data rate only 1.544 Mbps, T1s are not scalable or flexible enough to support the high bandwidth demand of LTE.

With LTE, traditional T1 backhaul will not work and wireless operators are faced with the challenge of potentially high operating expenses with minimal revenue growth. As data demand continues to grow, the "traffic per cellular customer is now rising markedly faster than revenue per user" and wireless operators "must either find ways to boost their revenue per user or reduce operational expenses" (Breznick, 2009). Figure 2 demonstrates this challenge by comparing wireless operator revenue with traffic demand:

Figure 2: Revenue versus traffic demand



Source: Heavy Reading

How do wireless operators solve this backhaul challenge? The answer to this problem is Ethernet Backhaul. In addition to being more cost effective than T1s, Ethernet backhaul also has the scalability and flexibility to support the data demand of LTE. Stu Benington, Tellabs Director of Portfolio Strategy, supports this assertion when he writes:

> For those investing in Ethernet backhaul, both fiber and microwave networks are viable solutions. The benefits are clear, relative to TDM or SDH/SONET, Ethernet offers lower cost, greater scalability and flexibility and superior support for IP-based applications (2011).

Despite all the positive aspects of Ethernet backhaul, it does have some disadvantages. Because it is relatively new to the backhaul environment, Ethernet does not have an established pricing structure. Without an established pricing structure, wireless operators risk over paying for the backhaul service. Another issue with Ethernet backhaul is its lack of

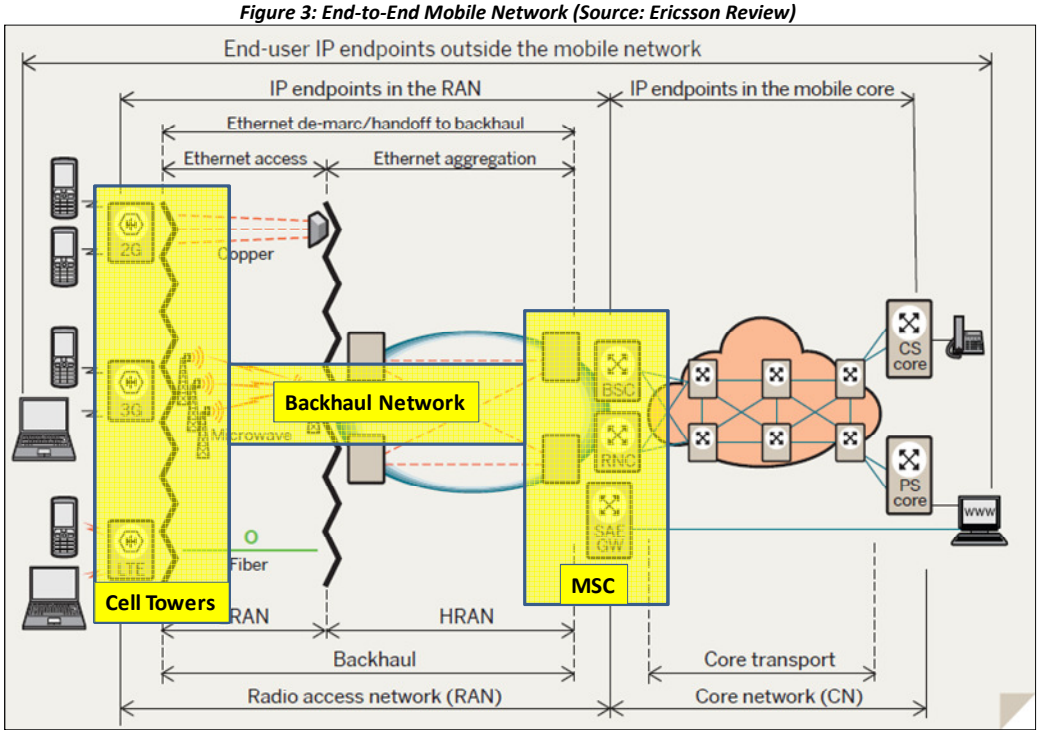
technical standardization. Ethernet backhaul service can vary from access provider to access provider. This variation can cause compatibility and interoperability issues within the wireless operator backhaul network, which ultimately impacts the wireless customers with dropped or poor quality of service.

A Request for Quotation (RFQ) is a good process to resolve both the pricing and technical standardization issues for the wireless operators. All the responses gathered from the RFQ will help the wireless operators select the access providers with the pricing structures and technical requirements for the backhaul network. The purpose of this paper is to document the cell site Ethernet backhaul RFQ process and provide the evaluation criteria of the access providers.

Chapter 2 - Cell Site Backhaul Background

The backhaul network is the network that connects the base stations at the cell towers to the Mobile Switching Center (MSC). These connections can be over copper, microwave, or fiber. Traffic (voice calls, data sessions, texts, video conferencing, etc) from mobile devices are converted to radio frequency (RF) signals to the cell towers to be backhauled to the MSC. The MSC then processes the traffic and transports it to the final destination (another wireless device, the internet, land line, etc). Figure 3, below, illustrates the end to end mobile network with the backhaul network highlighted in yellow.

Figure 3: End-to-End Mobile Network (Source: Ericsson Review)

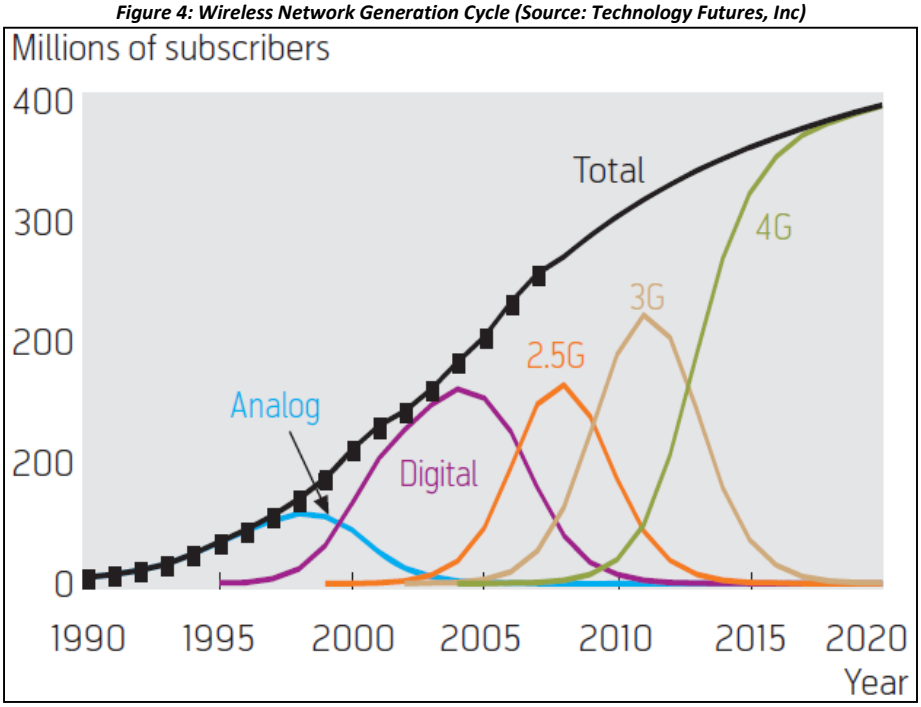


Traditionally, cell site backhaul has been dominated by the Incumbent Local Exchange Carriers (iLECs). As the local phone companies, the iLECs were the only options available for backhaul when the 2G/3G networks were turned up in the 1990s. The technology of choice for backhaul is TDM (Time Division Multiplexing) T1s. TDM is a digital multiplexing technique that

transfers bit streams, zeros and ones, between network nodes. The bit streams are divided into time slots on a sub channel call frame. The priority of the bits is on a first-come, first-served basis. TDM T1s are used in circuit switching, where the communication channel between network nodes is a dedicated circuit with a fixed bandwidth of 1.544 Mbps per T1. With their characteristics, TDM T1s are well suited for the more voice centric 2G/3G mobile network.

A 2G/3G cell tower needs an average three T1s for backhaul. Costing between $300 and $400 monthly and only capable of 1.544 Mbps of bandwidth each, T1s are limited in terms of cost and capacity. With the continued growth for smart wireless devices and increased customers demand for data, the limitations of T1s will be a bottle neck for the backhaul network and wireless operators. T1s are well suited for the 2G/3G backhaul; however, the 2G/3G network is nearing its end of the telecommunications life cycle. On the contrary, the 4G network is just beginning to peak as depicted in Figure 4.

Figure 4: Wireless Network Generation Cycle (Source: Technology Futures, Inc)



Long Term Evolution (LTE) has emerged as the 4G technology for the future. Offering "capacity of at least 100 Mbps downlink and 50 Mbps uplink" (Actiontec, 2011), LTE has become the next wireless technology evolution for the top three wireless operators - AT&T, Verizon Wireless, and Sprint. With those capabilities, the backhaul network for LTE will need to be robust and cost effective; Ethernet backhaul possesses these two qualities and, consequently, provides wireless operators with the ability to support the 4G network.

With its computer networking background, Ethernet is a very good fit for the more data centric 4G mobile network. Originated in the Local Area Networks (LANs), Ethernet is a packet based switching technology. Unlike the dedicated structure of TDM T1 at 1.544 Mbps, the Ethernet circuit can transmit packets for all traffic types at variable rates. In addition, the bandwidth on the Ethernet circuit is shareable across all traffic types. With copper and fiber based mediums, an Ethernet circuit has very flexible bandwidth profiles up to 1,000 Mbps for backhaul on a single physical connection. With LTE, the traffic is mainly Internet Protocol (IP) based. According to Michael Howard, Ethernet backhaul "has been and will be the best layer 2 transport mechanism for IP packets" (Howard, 2010). In addition, "the costs of Ethernet backhaul are well under half of TDM costs" (Howard, 2010).

Despite its financial appeal and flexibility, Ethernet backhaul does not have any established market pricing structure. With Ethernet backhaul being relatively new, wireless operators do not want to over pay. In addition, Ethernet backhaul lacks technical standardization. Both wireless operators and access providers have unique service definitions, architecture designs, and requirements. These variations will create compatibility and inoperability issues in the backhaul network. Finally, Ethernet backhaul is not ubiquitously

available like TDM T1s. For the wireless operators, knowing the Ethernet availability helps them manage the upgrade to 4G LTE more effectively.

With over 100 access providers across the country, Ethernet pricing, technical standardization, and availability can all be challenges. To help resolve these three issues, a Request for Quotation (RFQ) can be used by the wireless operator. With the promise of potentially huge revenue, the access providers are motivated to participate in the RFQ process. According to CTIA, there were 256,920 cell sites in the United States as of June 2011. If all these cell sites are upgraded to support 4G LTE via Ethernet, assuming just $1,000 MRC (monthly recurring charge – equivalent to the current spend of 3 T1s) per cell site, the potential yearly revenue is in the billions of dollars. Results from the RFQ will help the wireless operator select the access providers with the right pricing structures with the right Ethernet backhaul solutions. In addition, the RFQ results will assist in confirming Ethernet backhaul availability at each cell site. For sites without Ethernet backhaul, the wireless operator can develop alternative plans to turn up 4G LTE.

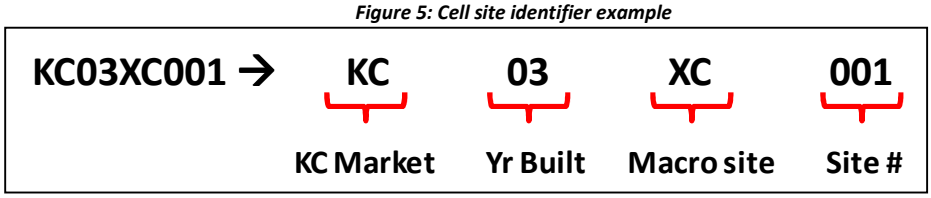
Chapter 3 - Request for Quotation Process

3.1 - Preparing the Request for Quotation

One of the most important aspects in an RFQ is to provide accurate data. For an Ethernet Cell Site Backhaul RFQ, the cell site information is critical as the access providers will be using this information to develop their responses. Below are the RFQ fields required for the Request for Quotation (RFQ):

- Cell Site Identifier – a unique ID that identifies a cell site. For ABC Telecom, this identifier is a 9 character code that provides the market, cell site built year, type of cell site, and cell site number designation. Below is an example of the cell site identifier.

Figure 5: Cell site identifier example



- Market – this field represents the market/city or geographical region of the country. This refers to the MTA (Major Trading Area) or BTA (Basic Trading Area). New York City is an example of a market, which has over 1,000 cell sites.
- Cell Site Address – basic address information for the cell site. This includes the address, city, state and zip code.
- Cell Site Latitude and Longitude – latitude and longitude coordinates of the cell sites. These coordinates should match to the address of the cell site.

- Mobile Switching Center (MSC) – physical location where regional cell site traffic aggregates for processing. This is a well known location in the telecom industry with established CLLI (Common Language Location Identifier) code.
- MSC Address – basic address information for the MSC. This includes the address, city, state and zip code

For a wireless operator, these fields can exist in multiple internal databases (billing, site development, circuit inventory, internal organization specific database, etc). With multiple databases, inevitably there will be data integrity issues. The wireless operator must ensure data integrity for accuracy. Any inaccurate data released to the access providers present potentially unnecessary rework. By investing the upfront time for accuracy, rework can be greatly reduced.

Once accurate information is obtained, Microsoft Excel or other spreadsheet programs can be used to assemble all the data. The spreadsheet serves two purposes. The first is to provide RFQ information to the access providers about the cell sites and MSCs. Below is an example of the assembled RFQ data for the Kansas market with actual addresses replaced with "xx" and "xxxx" to protect the information.

Figure 6: Assembled cell and MSC data

Market	Cell ID	Cell Address	Cell City	Cell ST	Cell Zip	Cell Lat	Cell Long	MSC CLLI	MSC Address	MSC City	MSC State	MSC Zip
Kansas	KC03XC001	xxxx WARD PARKWAY	Kansas City	MO	xxxxx	38.xxxx	-94.xxxx	LENXKSxx	xxxx W xxxTH ST	LENEXA	KS	xxxxx
Kansas	KC03XC002	xxxx EAST xxxxTH STREET	Kansas City	MO	xxxxx	38.xxxx	-94.xxxx	LENXKSxx	xxxx W xxxTH ST	LENEXA	KS	xxxxx
Kansas	KC03XC003	xxxx SOUTH METCALF	Overland Park	KS	xxxxx	38.xxxx	-94.xxxx	LENXKSxx	xxxx W xxxTH ST	LENEXA	KS	xxxxx
Kansas	KC03XC004	xxxx MAIN STREET	Kansas City	MO	xxxxx	39.xxxx	-94.xxxx	LENXKSxx	xxxx W xxxTH ST	LENEXA	KS	xxxxx
Kansas	KC03XC005	xxxx WOODLAND ROAD	Olathe	KS	xxxxx	38.xxxx	-94.xxxx	LENXKSxx	xxxx W xxxTH ST	LENEXA	KS	xxxxx
:	:	:	:	:	:	:	:	:	:	:	:	:
:	:	:	:	:	:	:	:	:	:	:	:	:
:	:	:	:	:	:	:	:	:	:	:	:	:
Kansas	WT73XC211	xxxx LUNGER ST.	Augusta	KS	xxxxx	37.xxxx	-96.xxxx	LENXKSxx	xxxx W xxxTH ST	LENEXA	KS	xxxxx
Kansas	WT73XC213	xxxx E. COMMERCE	Andover	KS	xxxxx	37.xxxx	-97.xxxx	LENXKSxx	xxxx W xxxTH ST	LENEXA	KS	xxxxx
Kansas	WT73XC214	xxxx SOUTH BROADWAY	Wichita	KS	xxxxx	37.xxxx	-97.xxxx	LENXKSxx	xxxx W xxxTH ST	LENEXA	KS	xxxxx
Kansas	WT73XC215	xxxx E KELLOGG	Wichita	KS	xxxxx	37.xxxx	-97.xxxx	LENXKSxx	xxxx W xxxTH ST	LENEXA	KS	xxxxx

The second function of the spreadsheet is to serve as a repository to gather each access provider responses to the RFQ. With the sorting, filtering, formatting, and pivot table capabilities, Microsoft Excel is a very effective tool with which to compare and contrast the RFQ responses during the evaluation process.

In order to analyze the RFQ responses, the wireless operator must determine the key benchmarks to gather for each access provider. As with any RFQ, one of the key benchmarks is the cost. However, with cell site Ethernet backhaul, there are other important components to consider:

- On-net/Near-Net → on-net means an access provider has a presence at the cell site with fiber or microwave capability to provide Ethernet backhaul. Near-net means the access provider is nearby and is willing to build backhaul to the cell site.
- Deployment interval → assuming an access provider gets the business for a cell site, this field tells the wireless provider the time interval to turn up Ethernet backhaul.
- Interconnection Point → the physical location where an access provider plans to aggregate the backhaul traffic and handoff to the wireless operator. The MSC is the preferred interconnection point for the wireless operator; however, some access providers are boundary limited and cannot handoff at the MSC. This complication adds cost to transport the traffic to the MSC.
- 5/7 year pricing term option → typically monthly leased service fee are called MRC (monthly recurring charge), these two term options allow for pricing flexibility. Both the wireless operators and access providers can choose the term(s) that is financially viable

- Pricing for various bandwidths → request for access providers to quote pricing for 50 Mb, 100 Mb, 200 Mb, 300 Mb, 400 Mb, 500 Mb, & 1,000 Mb bandwidth options. This covers all potential bandwidth scenarios and future backhaul growth for the wireless operator. Figure 7 displays the key benchmarks discussed above. Items highlighted in yellow and purple are to be completed by the access providers for each cell site assuming they can provide Ethernet backhaul.

Figure 7: Benchmarks to be filled by Access Providers

					5 Year MRC Pricing									7 Year MRC Pricing								
Market	Cell ID	On-Net Near-net	Deployment Interval	Inter Connection Point	50 Mb	100 Mb	150 Mb	200 Mb	250 Mb	300 Mb	400 Mb	500 Mb	1 GigE	50 Mb	100 Mb	150 Mb	200 Mb	250 Mb	300 Mb	400 Mb	500 Mb	1 GigE
Kansas	KC03XC001																					
Kansas	KC03XC002																					
Kansas	KC03XC003																					
Kansas	KC03XC004																					
Kansas	KC03XC005																					
:	:																					
:	:																					
:	:																					
Kansas	WT73XC211																					
Kansas	WT73XC213																					
Kansas	WT73XC214																					
Kansas	WT73XC215																					

Just as important as gathering RFQ responses is ensuring that the access providers fully comprehend the technical requirements for Ethernet backhaul. Unlike backhaul on T1s on TDM, Ethernet backhaul is relatively new technology and has not been universally standardized across the telecom industry. To help the access providers, wireless operators should provide Ethernet backhaul technical specification document. This specification outlines all the requirements needed for the products or services to be purchased in the RFQ. The technical specification should provide the following:

- Outline of Ethernet requirements to support wireless operator's backhaul network
- General desired architectures or topologies to be implemented
- Performance requirements to be engineered
- Service Level Agreements (SLAs) for contract inclusion.

- The company's interpretation of the Ethernet definitions or designs

As the name suggests, the technical specification is detailed and potentially complex. This complexity becomes difficult to manage when written feedbacks are received from the access providers. A good way to manage the technical feedbacks is to develop a compliance matrix to accompany the technical specification. The compliance matrix is a summary of the key sections and requirements of the technical specification. From the wireless operator's view, the compliance matrix dictates which technical requirements are mandatory, negotiable (for business reasons), and informational. It also provides an area for additional comments or explanations of the compliancy. With the compliance matrix, wireless operators can easily weed out access providers that do not meet their technical specifications.

In addition to the technical specification, the wireless operator should also provide a Scope of Work matrix to the access providers. The Scope of Work matrix establishes all the cell site activities that need to be completed in order to enable Ethernet backhaul. Enabling Ethernet backhaul requires a lot of work as the site will need fiber. Building fiber for Ethernet backhaul requires the following, but not limited to: civil construction, architecture and engineering, project management, and site acquisition. All the activities to be completed are outlined in the Scope of Work Matrix.

For each activity in the Scope of Work matrix, the access provider needs to determine the roles and responsibilities for all parties involved. The RACI (Responsible, Accountable, Consulted, & Informed) model is a useful framework for designating roles and responsibilities. Below are the definitions of RACI:

- Responsible – "R" means "The Doer." The "Doer" is the person or group who actually completes the task. The "doer" is responsible for action and implementation. Responsibility can be shared. The degree of responsibility is determined by the individual with the "A".
- Accountable – "A" means "The Buck Stops Here." This person or group is ultimately accountable for the activity or decision. This includes "yes" or "no" authority and veto power.
- Consulted – "C" means "In the Loop." The consultant is an individual or group (typically subject matter experts) to be consulted prior to a final decision or action.
- Informed – "I" means "Keep in the Picture." This person or group needs to be informed after a decision or action is taken. They may be required to take action as a result of the outcome.

The purpose of the Scope of Work matrix is to create a baseline for all bidders to provide their quotes accurately. If all the access providers have the same understanding of their responsibilities, the bids they provide will be consistent and will make the evaluation process more efficient. Therefore, it is in the best interest of the wireless operators to ensure all bidders agree to the scope of work. Any deviation by the access providers from the scope of work will add unwanted costs and inefficiency to the project.

The final document that assimilates all the data is the RFQ letter. Written on a wireless operator letter head, this letter formally requests the participation of each access provider to the cell site Ethernet backhaul RFQ process. It outlines the purpose for issuing the RFQ and stresses the need for each access provider to comply with the technical specification and scope

of work matrix. It also summarizes all the documents to be included in the RFQ and gives explicit instructions for access providers on how to respond to the RFQ. In addition, the letter provides the wireless operator contact information if someone has questions or requires clarification. Another important requirement for the RFQ letter is the due date. This due date should be 4-6 weeks from the RFQ release. The access providers need these 4-6 weeks to provide an effective response. Finally, the letter should contain some standard legal statements or disclosures to protect the wireless operator from any potential issues.

The RFQ should now include the following:

- Spreadsheet with cell site information, MSC locations, and serves to collect RFQ responses from the access providers
- Technical specification and compliance matrix
- Scope of Work Matrix with RACI designation
- Formal RFQ letter

The estimated time to complete the RFQ preparation is about three weeks. The first two weeks should be used to gather the cell site and MSC information, to ensure data accuracy, to collect all supporting documents, to develop the RFQ bid sheet, and to create the RFQ letter. When all the documents are compiled, the RFQ should be reviewed internally with all the key stake holders for any changes or additions. Use the last week to set up internal reviews and make the necessary modifications to the RFQ.

3.2 - Issuing the Request for Quotation

With all the required documents and internal reviews completed, the RFQ is set for release, but the wireless operator will need to determine a strategy on who should receive the RFQ. Two strategies are available:

1. Issue RFQ to all access providers
2. Issue RFQ to only the main access providers

The first strategy will offer the best coverage from an Ethernet backhaul availability standpoint. With all access providers receiving the RFQ, the Ethernet coverage will be maximized. This strategy also drives more competition between the access providers, thus giving the wireless operator great pricing flexibility. However, this option requires the wireless operator to invest greater time and energy. Every access provider will want to have discussions about the RFQ process. The wireless operator will need to be available to answer questions and provide clarifications from all bidders. Understanding and sorting through all the responses *is* another obstacle to consider. This option also creates a burden on the Supply Chain and vendor relations team during the contract negotiations phase. Another potential problem is operational inefficiency because of multiple access providers.

The second strategy is less taxing on the wireless operator because the volume of bidders is smaller. Less time and energy will be spent by the wireless operator answering questions or providing clarifications. With fewer bidders involved, time spent understanding and sorting through the RFQ responses will be greatly reduced. Additionally, these vendors most likely have existing working relationship, thus making the contract negotiation phase smoother. Operation efficiency is also achieved with less access providers. However, with

fewer bidders involved, the strategy does not facilitate pricing competition and the Ethernet backhaul coverage suffers accordingly.

Considering all the pros and cons, neither strategy offers an overall benefit to the wireless operator. The best strategy in issuing the RFQ is a combination of both options. By combining both strategies, the wireless operator achieves competition between access operators and maximizes the Ethernet backhaul coverage. Throughout the RFQ process, the right combination of access providers will be identified. This will optimize the efficiency in both contract negotiations and operational support. The combination of both strategies gives the wireless operator the best RFQ results.

Before the RFQ can be issued, the wireless operator must identify the contact names and emails for each access provider. This information should be available through the Supply Chain or Vendor Relations groups. Besides providing the contact information, these two groups will also help to ensure that a Non-Disclosure Agreement (NDA) is in place for each access provider. With the RFQ, the wireless operator is providing a lot of sensitive and propriety information that needs to be protected. The NDA serves to prevent each access provider from sharing private RFQ information to any third party.

Once all the contacts are identified and the NDAs are executed, the RFQ can be released. One of the methods for releasing the RFQ is through email. The contents of the RFQ letter should be used as the body of the email to communicate to the access providers. All the other documents, including the formal RFQ letter, will be attached to the email as references.

The wireless operator can choose to send one email to all access providers using the Blind Carbon Copy (Bcc) function in Microsoft Outlook or other email programs. The Bcc

function hides all the access provider names involved in the RFQ, which complies with NDA process. The problem with sending one email using Bcc is tracking the responses. With all the responses having subject heading, it will be difficult to manage. Another potentially difficult issue is that only the originator of the RFQ email knows the distribution of the bidders. This tracking only exists in the originator's sent email folder. The advantage of this method, however, is its speed and all of the bidders will receive the same information.

A second method to consider is sending each access provider the RFQ. With about 100 access providers, this process is very tedious and time consuming. The wireless operator also has to ensure all 100 emails have the same information and format. Microsoft Outlook has a copy function that can help alleviate these two issues. The originator can create one email in Microsoft Outlook and save it as a draft. Using the copy function, the email can be replicated as many times as needed. Simply add the name of each access provider in the subject field when sending out the email. Though tedious, this method will benefit the wireless operator when tracking and following up on the RFQ responses. The wireless operator should use this second method to release RFQ to each access provider.

3.2.1 - Access Provider Analysis

With the RFQ released, let's analyze the access providers and understand their niche in the cell site backhaul environment. Since there are over 100 access providers available, it will be difficult to assess each provider individually. To make this assessment easier, the access providers can be categorized into four groups – Incumbent Local Exchange Carrier (iLECs), Cable Multiple System Operators (MSOs), Alternative Access Providers (AAVs) and Competitive Local Exchange Carriers (CLECs).

The incumbent Local Exchange Carriers (iLECs) are the local telephone providers and have the majority of the TDM T1 cell site backhaul business today. Also known as the Regional Bell Operating Companies (RBOCs), the iLECs includes AT&T, Verizon, and CenturyLink (consisting of Embarq, CenturyTel, & Qwest). With the biggest coverage footprint, the iLECs have the potential to gain the most Ethernet backhaul business. This potential allows them to offer aggressive pricing with volume discount for Ethernet backhaul. Because they provide service today, the iLECs have the most cell site backhaul experience and are already built to the majority of the cell sites and MSCs. Despite all their apparent strengths, the iLECs do have a few weaknesses. The iLECs have a large customer base and, consequently, it is hard for the iLECs to customize or modify their services for an individual customer. Also, their services and products are limited within a geographical area call LATA (Local access and transport area). As the incumbent TDM providers, the iLECs do not want to lose any future Ethernet backhaul business to the other access providers. From the wireless operators' point of view, they prefer not fund the iLECs as the iLECs also provide wireless services in the case of AT&T and Verizon.

Unlike the iLECs, the Cable Multiple System Operators (MSOs) are relatively new to the cell site backhaul environment. The Cable MSOs do provide TDM T1s today, but only in a very limited capacity. Their coverage footprint rivals that of the iLECs as they are the cable TV providers. With their larger footprint and potential business opportunity, the Cable MSOs can offer volume price discounts. Another Cable MSOs' strength is Ethernet experience through their existing residential and commercial businesses. For the Cable MSOs, Ethernet backhaul represents a great opportunity to expand into the cell site business and increase their revenue. Because they have limited backhaul TDM T1s today, the Cable MSOs are still developing their experience in the backhaul arena. Similar to the iLECs, their coverage is restricted by the cable boundaries. There are some overlaps, but generally one cable MSO cannot cross into another cable MSO area. Comcast, Time Warner Cable, and Cox are three of the biggest Cable MSOs in the country.

The Alternative Access Vendors (AAVs) are the third group of access providers. Smaller in size and coverage footprint, the AAVs are regional access providers with limited existing TDM T1 backhaul business. Because of the smaller size, the AAVs are very responsive and flexible to customer's needs. They can also customize their services and products and do not have any boundary limitations. The AAVs are capable of aggressive pricing, but lack the volume to provide further discounts. One of their weaknesses is their small coverage footprint. For a particular market, there could be multiple AAVs present. Multiple AAVs mean the wireless operator has more contracts and companies to manage. Similar to the Cable MSOs, Ethernet backhaul provides the AAVs the opportunity to increase their revenue and expand their footprint. The stability of some AAVs is uncertain as they can be acquired by other companies

at any time. The list of AAVs is very diverse and includes Electric Lightwave, Tower Cloud, Florida Power and Light, and DukeNet.

Competitive Local Exchange Carriers (CLECs) are the last group of access providers. Similar to the AAVs in size and coverage footprint, these access providers were originally created to compete against the iLECs. The Telecommunications Act of 1996 gave rise to the CLECs to promote competition in the local and long distance phone service. The CLECs pros and cons are very similar to those in the AAV grouping. Depending on the market or geographic area, these access providers qualify both as a CLEC and AAV. Windstream (formerly Kentucky Data Link), Time Warner Telecom, and XO communications are companies in this category.

Understanding the strengths, weaknesses, opportunities, and threats (SWOTs) of the different access providers is invaluable in evaluating the RFQ responses. Below is the SWOT matrix that summarizes the four access provider groupings:

Figure 8: Access Provider SWOT Matrix

Strengths	Access Providers	Weaknesses
Large footprint/coverage Cell Site Backhaul Experience Volume discount Incumbent provider	ILECS	Set products/services LATA Boundary limitation
Large footprint/coverage Ethernet experience Volume discount	Cable MSOs	Limited Cell Site Backhaul experience Cable Boundary Limitation
Business flexibility No boundary limitation Aggressive pricing	AAVs/CLECs	Regional and small footprint Lack Volume Discount Multiple access provider solutions
Revenue through Ethernet Keep existing TDM customers	iLECs	Enabling competitors
Expansion to cell site backhaul Increase revenue	Cable MSOs	
Expand footprint Increase revenue	AAVs/CLECs	Mergers & acquisitions
Opportunities	**Access Providers**	**Threats**

3.2.2 - RFQ Bidding Strategy

Upon receiving the RFQ, the access providers should use the time between now and the due date to fully understand the RFQ. During this period, the access providers should set up conference calls or face to face meetings with the wireless operator to qualify and clarify any issues they might have. The access provider must have a full grasp of the Technical Specification and Scope of Work Matrix. Results from these sessions will help the access provider develop a response that meets the wireless operator's needs with reasonable prices.

The access providers should not gold plate the solution, but instead design solution that adheres as closely to the specification as possible. Gold plating the solution has a direct impact on the overall price of the Ethernet solution and may eliminate the access provider from consideration. By designing to meet certain specifications, the access provider maximizes the price so as to be competitive with the other bidders.

Once the Ethernet backhaul RFQ is fully understood, the access provider needs to consider different bidding approaches. The first approach is to provide an average blended rate for all sites the access provider plans to bid. In this "win some lose some" approach, the access provider is using the same pricing structure for all sites. High-cost sites, medium-cost sites, and low-cost sites are treated equally. The flaw in this approach is that the wireless operator may only select specifics sites that are priced lower than other bidders. These selected sites may end up being the high-cost sites and will not meet the internal economics for that particular access provider. The end result is the access provider will not be able to serve those sites cost effectively and, thus, is eventually eliminated from the RFQ.

The second bidding approach is to use a tiered pricing model. Sites in the bid are separated into three tiers and are priced accordingly. Low cost sites are grouped in Tier 1 and can be priced very competitively by the access provider. Tier 2 consists of medium cost sites and are priced higher than sites in Tier 1. High cost sites are grouped in Tier 3 and have the highest pricing structure. Depending on the internal economics, the access provider can set as many tiers as warranted. This approach gives the wireless operator the pricing flexibility to select sites and provides less economic impacts to the access provider. With the bidding approach understood, let's review the RFQ evaluation process.

3.3 - Initial RFQ Evaluation

In order to effectively evaluate and analyze the RFQ responses, the wireless operator must establish guiding principles to help with the selection process. For Ethernet cell site backhaul, the following principles are recommended:

- Maximize Ethernet backhaul coverage while optimizing overall pricing structure
- Ensure multiple access providers strategy on a per market basis
- Optimize access providers to maintain operational efficiency

Ethernet backhaul is not ubiquitously available so it is in the best interest of the wireless operator to maximize the coverage to support 4G LTE. However, this coverage maximization needs to come with pricing optimization. This combination will give the best overall coverage and cost structure. The second principle will promote pricing competition in the market, which contributes to the goal of the first principle. It allows for vendor diversity and flexibility within a market for future developments or changes. In addition, this principle spreads out the Ethernet backhaul work to multiple vendors, which increases productivity. The third principle balances out the second principle to ensure operational and managerial efficiency once the Ethernet backhaul services are turned up.

As the RFQ bids are received, the access provider's first task is to review the bid sheets to ensure the responses are in the correct format. With the responses formatted appropriately, the wireless operator can evaluate and analyze the bid information much more efficiently. If a RFQ response is not formatted correctly, the wireless operator needs to ask the access provider to resubmit the response in the right format. With all the RFQ responses in the correct format, the next step is for the wireless operator to consolidate all bids into a master bid summary.

Since the RFQ requested pricing for multiple bandwidth options, the wireless operator should determine the preferred bandwidth for evaluation in the master bid summary. This allows for one common point to compare the prices. The 100 Mb is a common Ethernet service offering by all access providers, which makes it a good choice to use for comparison. In addition, for some access providers, the prices for 50 Mb and 100 Mb will be the same because of their internal economics. This is a benefit for the wireless operators because they can double their bandwidth with no price increase. Finally, the wireless operator needs to pick which pricing term, five or seven year, with which to compare the 100 Mb. The seven year term is preferred as it will yield lower pricing versus the five year term.

Besides giving the wireless operator a common price point to compare, the master bid summary also shows how many bidders are located at a particular cell site. By knowing the number bidders and their prices on a site by site basis, the wireless operator can use this information to encourage competition in order to achieve optimum pricing for each individual site. With a consolidated view, the wireless operator confirms and knows which sites do not have Ethernet backhaul. This knowledge will help the wireless operator develop alternative plans for backhaul to support 4G LTE. Figure 9 below shows the master bid summary example for ten access providers. For a wireless operator issuing the RFQ, the actual master bid summary will contain thousands of sites with up to 100 bid responses.

Figure 9: Sample Master Bid Summary

		7 Year MRC Pricing									
		Vendor 1	Vendor 2	Vendor 3	Vendor 4	Vendor 5	Vendor 6	Vendor 7	Vendor 8	Vendor 9	Vendor 10
Market	Cell ID	100 Mb	100 Mb	100 Mb	100 Mb	100 Mb	100 Mb	100 Mb	100 Mb	100 Mb	100 Mb
Kansas	KC03XC001	$ 3,000		$ 1,700		$ 2,800		$ 1,600		$ 2,100	
Kansas	KC03XC002	$ 2,000	$ 2,500			$ 2,000	$ 2,100	$ 1,600		$ 2,100	$ 2,000
Kansas	KC03XC003	$ 3,000	$ 2,500	$ 1,700				$ 1,800	$ 1,700	$ 1,800	
Kansas	KC03XC004	$ 1,750		$ 2,700	$ 1,550		$ 1,700	$ 1,800		$ 1,800	
Kansas	KC03XC005		$ 2,500		$ 2,250	$ 2,800	$ 1,700	$ 1,600	$ 2,300		$ 1,600
Kansas	WT73XC211										
Kansas	WT73XC213			$ 2,200	$ 2,250		$ 2,800	$ 2,200	$ 2,300		$ 2,000
Kansas	WT73XC214	$ 1,750	$ 2,500		$ 1,550	$ 2,000				$ 1,700	
Kansas	WT73XC215	$ 1,750	$ 2,500	$ 2,500	$ 2,250	$ 2,800	$ 2,000	$ 2,200	$ 1,700		$ 1,600

As implied by the Request for Quotation, one of the main objectives is to identify the lowest cost and the corresponding access provider for each cell site. This identification can be completed by using the "Min" function within Microsoft Excel or other spreadsheet programs. For a particular site, the "Min" function looks at all the 100 Mb bids in that particular row and returns the lowest value. With the lowest value, the wireless operator can find the corresponding bidder with this price. Figure 10 demonstrates the "Min" function and shows the associated access provider.

Figure 10: Lowest price & vendor example

				7 Year MRC Pricing									
				Vendor 1	Vendor 2	Vendor 3	Vendor 4	Vendor 5	Vendor 6	Vendor 7	Vendor 8	Vendor 9	Vendor 10
Market	Cell ID	Low Price	Low Price Vendor	100 Mb	100 Mb	100 Mb	100 Mb	100 Mb	100 Mb	100 Mb	100 Mb	100 Mb	100 Mb
Kansas	KC03XC001	$ 1,600	Vendor 7	$ 3,000		$ 1,700		$ 2,800		$ 1,600		$ 2,100	
Kansas	KC03XC002	$ 1,600	Vendor 7	$ 2,000	$ 2,500			$ 2,000	$ 2,100	$ 1,600		$ 2,100	$ 2,000
Kansas	KC03XC003	$ 1,700	Vendor 3	$ 3,000	$ 2,500	$ 1,700				$ 1,800	$ 1,700	$ 1,800	
Kansas	KC03XC004	$ 1,550	Vendor 4	$ 1,750		$ 2,700	$ 1,550		$ 1,700	$ 1,800		$ 1,800	
Kansas	KC03XC005	$ 1,600	Vendor 7		$ 2,500		$ 2,250	$ 2,800	$ 1,700	$ 1,600	$ 2,300		$ 1,600
Kansas	WT73XC211	No Bid	No Bid										
Kansas	WT73XC213	$ 2,000	Vendor 10			$ 2,200	$ 2,250		$ 2,800	$ 2,200	$ 2,300		$ 2,000
Kansas	WT73XC214	$ 1,550	Vendor 4	$ 1,750	$ 2,500		$ 1,550	$ 2,000				$ 1,700	
Kansas	WT73XC215	$ 1,600	Vendor 10	$ 1,750	$ 2,500	$ 2,500	$ 2,250	$ 2,800	$ 2,000	$ 2,200	$ 1,700		$ 1,600

With the initial lowest price and access provider identified, the wireless operator has a preliminary view of the RFQ results based on solely on cost. This preliminary view will have too

many vendors on a market basis to be manageable. The wireless operator will need to reduce the current vendors down to more acceptable level.

To achieve this acceptable level, the wireless operator needs to evaluate each access provider using key benchmarks in the RFQ response. The first benchmark is determining whether the cell site is on-net or near-net with each access provider in the preliminary view. On-net sites have fiber already present and will have a faster turn up interval. With fiber already available at the site, the access provider will have low construction cost, which results in better pricing. Near-net sites do not have fiber and will require fiber build out. Fiber construction will extend the deployment interval and the price will be higher because access providers need to recoup their investments.

The second key benchmark that can be applied is comparing the access providers' development intervals for each cell site. This benchmark is highly correlated with the on-net or near-net designation as it is dependent on the fiber build out. Other factors that drive deployment intervals are the various construction codes, zoning and permitting issues, seasonal patterns, and problematic landlords. For the wireless operator, the preference is to turn up sites as quickly as possible to support customers.

The third benchmark the wireless operator can evaluate is whether the access provider is delivering traffic to the MSC. The MSC is the preferred interconnection point for the wireless operator because the traffic can be connected to the core network. If the interconnection point is not at the MSC, the wireless operator will have to incur additional costs by investing capital or lease from third parties to transport traffic back to the MSC. This non-MSC interconnection issue impacts the iLECs and Cable MSOs more as they are limited by LATA and

cable boundaries respectively. Coupled with delivery to the MSC, the wireless operator wants to optimize the number of access providers in each MSC. In order to handoff traffic to the wireless operator, each access provider will need to co-locate their telecom equipment at the MSC. This collocation requires space, power, and connectivity at the MSCs, which adds costs to the wireless operator's overall budget. As more access vendors are collocating their equipment, the cost increases accordingly and contributes to operational inefficiencies.

In addition to the key benchmarks, the wireless operator must ensure each access vendor complies with the technical specification and adheres to the Scope of Work. By complying with the technical specification, the access provider assures that Ethernet backhaul solution will work properly when the service is turned up. In agreeing to the Scope of Work, the access provider understands all the roles and responsibilities involved in deploying Ethernet backhaul. If there are any major deviations, the access provider can be eliminated from RFQ consideration. Minor deviations can be negotiated and clarified during the RFQ process.

Another factor that wireless operators need to review are the business terms and conditions in the RFQ responses. Some access providers may request upfront payment called NRC (Non Recurring Charge) or special construction fee to cover the cost of construction. This cost occurs more at near-net sites than on-net. This payment can be significant and impacts the overall price. Certain access providers require sites to be purchased as a bundle to get the current pricing. Others may include volume commitment that the wireless operator has to meet; otherwise the pricing will go up.

Finally, the wireless operator should review the cost to grow for each access provider. Currently, the evaluation is based on the prices at 100 Mb. Some access providers will give a

very aggressive and teaser rate at 100 Mb. However, for the higher bandwidths (200 Mb and above) the pricing increases dramatically. Ultimately, this will impact the wireless operator's ability to grow as traffic demand increases. For these access providers, their intent is to make it through the first evaluation round with the low bids and eventually penalize the wireless operator financially on the higher bandwidths.

Once these filters and selection criteria are applied to the preliminary view, the wireless operator achieves a more thorough view of the RFQ results. After numerous revisions and modifications, this process will produce an optimized view of the RFQ results. For each market, the wireless operator has a good mix of access providers, competitive pricing structure, and the maximum associated Ethernet backhaul coverage. This meets the three previously mentioned guiding principles.

It takes approximately three weeks to achieve this. The first week will be spent reviewing the RFQ responses, ensuring the responses are in the correct format, and consolidating the responses into the master bid sheet for evaluation. The next two weeks are used to evaluate and analyze the responses to get to the preliminary view and, eventually, the optimized view.

3.4 - RFQ Rebid Process

By going through all these steps, the wireless operator has systematically reduced the access providers down to the desired few. However, the optimized view is based only on the initial RFQ responses. This view can be improved by going through the RFQ rebid process. Only the recommended access providers in the optimized view will be qualified for the rebid process. Generally, the initial list of access providers will be reduced by half in the rebid.

The rebid process takes about three weeks to complete. The first week is used to verbally communicate the initial results to the recommended access providers. The recommended access providers are given details on the sites for which they have been targeted. These details include the number of sites and the markets. The recommended access providers will want to know the market price points for the sites they have lost. This information will help the access providers to rebid more effectively in the future. It is important that the recommended access providers understand the initial results can change once the rebid process is completed. If another access provider comes back with a better proposal, the initial recommended access provider can lose their currently designated cell sites. Every recommended access provider in the optimized view will be given an opportunity to rebid. The wireless operator can determine the appropriate number of rebids to implement as time permits. After the verbal communication, the site list will be sent to the recommended access providers. Each recommended access provider will be given two weeks to complete the rebid process.

3.5 - Final RFQ Evaluation & Results

When the two week period is up, the wireless operator will receive the rebids. During this time, a few access providers will choose to opt out if the initial results were less than expected. Another reason for opting out is that these access providers cannot financially reach the competitive price points to win additional cell sites. The sites that were targeted for these opted out access providers will get distributed to the ones that are left. For those remaining access providers, their rebid prices become more aggressive so as to improve their chances of winning more cell sites and compete against the other bidders.

Once all the rebids are in, the wireless operator will apply the same three guiding principles:

- Maximize Ethernet backhaul coverage while optimizing overall pricing structure
- Ensure multiple access providers strategy on a per market basis
- Optimize access providers to maintain operational efficiency on a per market basis

The next step will be to consolidate all the rebids into the master rebid sheet. With the master rebid sheet, the wireless operator will repeat the evaluation process that was completed for the initial bids. The first step is to develop the preliminary view based on the rebid cost. The next step is to review the key benchmarks of on-net or near-net, deployment interval, and interconnection point. Since these recommended access providers are in the rebid process, they have all met the technical specification and Scope of Work, consequently, this step can be bypassed. However, the wireless operator will need to carefully review the rebid proposals for any unwanted business terms and conditions.

Similar to the initial evaluation, the wireless operation will go through multiple revisions before obtaining the final view of the RFQ results. This final view meets all three guiding principles and achieves better overall pricing due to the rebid. The time it takes to reach the final view is about two weeks. For the wireless operator, the last step is to confirm the final view with the access providers.

3.6 - Confirmation Process

The final view represents the cell sites that each access provider is targeted to win for Ethernet backhaul. This final view needs to be agreed upon by the access providers. In order to obtain agreement from each access provider, the wireless operator should issue a confirmation letter. The confirmation letter serves to validate all the terms and conditions for Ethernet backhaul between the wireless operator and each access provider. Below are the items in the confirmation letter that are needed to complete the RFQ process:

1. Verification that access provider will serve the selected cell sites in the final view or that the access provider wishes to be removed from consideration.
2. Access provider to include final pricing structure for the selected cell sites.
3. Access provider to supply final deployment interval for the selected cell sites.
4. Access provider to confirm interconnection point for the selected cell sites.
5. Access provider to accept and commit to the terms outlined in the Scope of Work matrix and technical specification.

For the first item number, it is critical that the wireless operator verify that each access provider agrees to the selected sites in the final view. These selected sites are a subset of the overall sites in the access provider rebid. For some access providers, this subset of sites may not be enough to warrant acceptance because they cannot support these sites financially. Similar to the rebid process, these access providers may choose to opt out. Another situation that may arise is an access vendor deselects a few sites as these specific sites are not economically feasible. At this stage of the process, the chance of an access provider opting out or deselecting sites is very small. However, when this does occur, the cell sites will get

absorbed by other access providers as there are generally coverage overlaps between access providers. The overlapping access providers also welcome any additional revenue.

As for the second item in the confirmation letter, the access provider is required to provide final pricing structure for the selected cell sites. Because these sites are a subset of their rebids, the pricing structure will go up for some access providers to meet their financial criteria. This increase is small and does not impact the overall cost structure of all the sites in the final view. Generally, there are not many changes in the pricing structure due to two reasons. With the access providers pricing structures set in tiers, this allows for flexibility and the ability to absorb any removed sites. With each market optimized, each access provider has a fair density of the market, which contributes to the stability of the prices.

For the last three items, the wireless operator just needs each access provider's agreement. It is more of a formality than a necessity as these items have remained the same since the beginning. All the access providers should have no issues with confirming the last three items.

Given all these steps, the confirmation process takes about two weeks to complete. With the confirmation letter, the wireless operator has an agreement from the access provider and can begin the fiscal approval process. Information in the confirmation letter will also be used during the negotiation and execution of the contract by Supply Chain or the Vendor Relations team. The final task for the wireless operator is to notify the non-winning access providers and thank them for their participation.

Chapter 4 - Conclusion

Ethernet backhaul is new technology for the wireless operators. As with anything new, there will be challenges in need of resolutions. For the wireless operator launching 4G LTE using Ethernet backhaul, the main challenge will lie in determining the cost structure, in addition to ensuring technical compliancy. With over 100 access providers selling Ethernet backhaul, the wireless operators must choose wisely. By issuing the Request for Quotation, the wireless operator will have the ability to individually evaluate each access provider and their Ethernet backhaul solution.

To effectively evaluate the access providers' RFQ responses, the wireless operator will need to determine the appropriate guiding principles. With the guiding principles as the baseline, the key benchmarks must be applied, along with other criteria, to help with the evaluation process. By doing this, the wireless operator has systematically determined the optimum mix of access providers with the right pricing structure, while meeting the technical specification. It will take numerous iterations before arriving to the final RFQ results. The final step is to receive the confirmation from the access providers on the final results.

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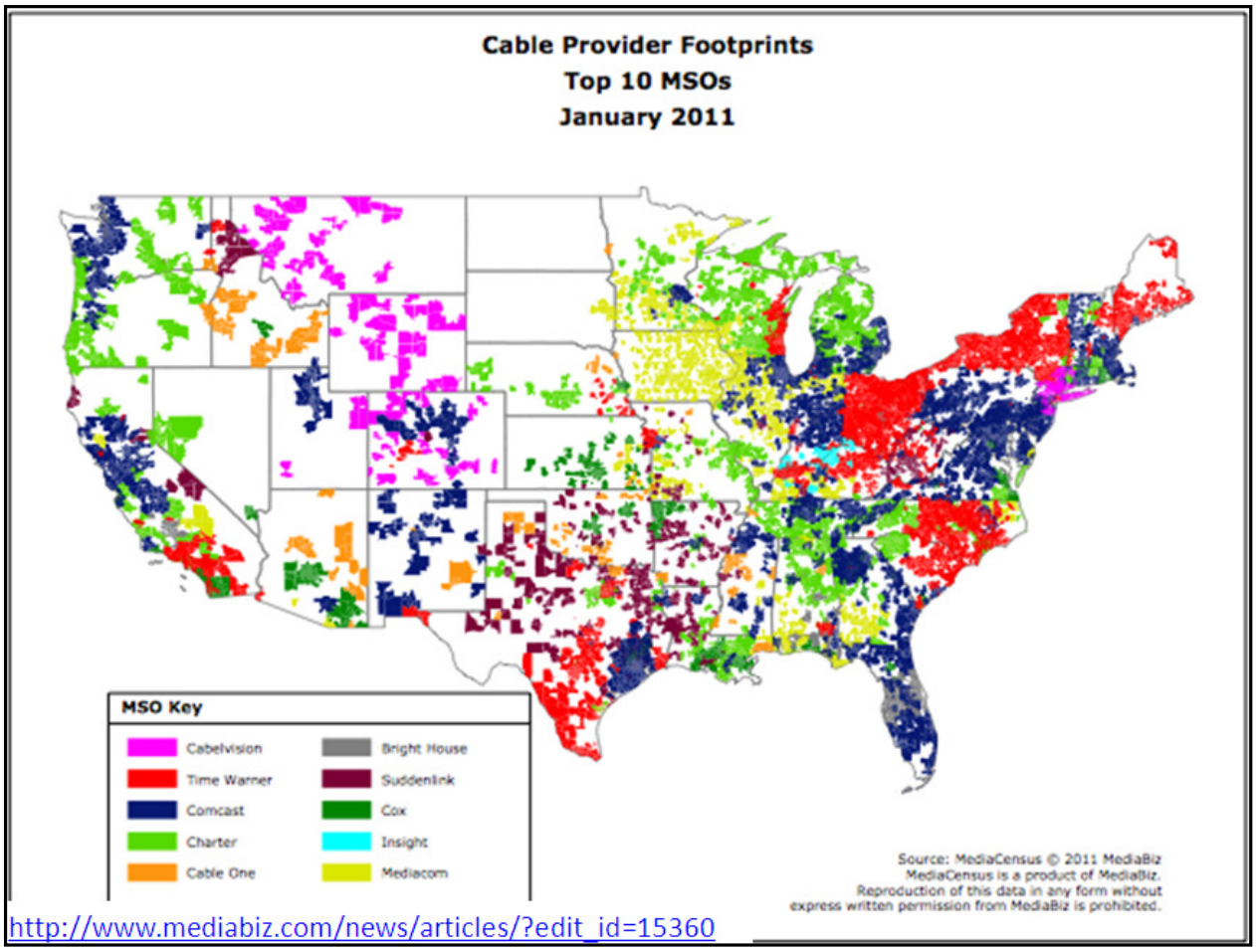
Appendices

Sample Scope of Work Matrix w/ RACI Designation

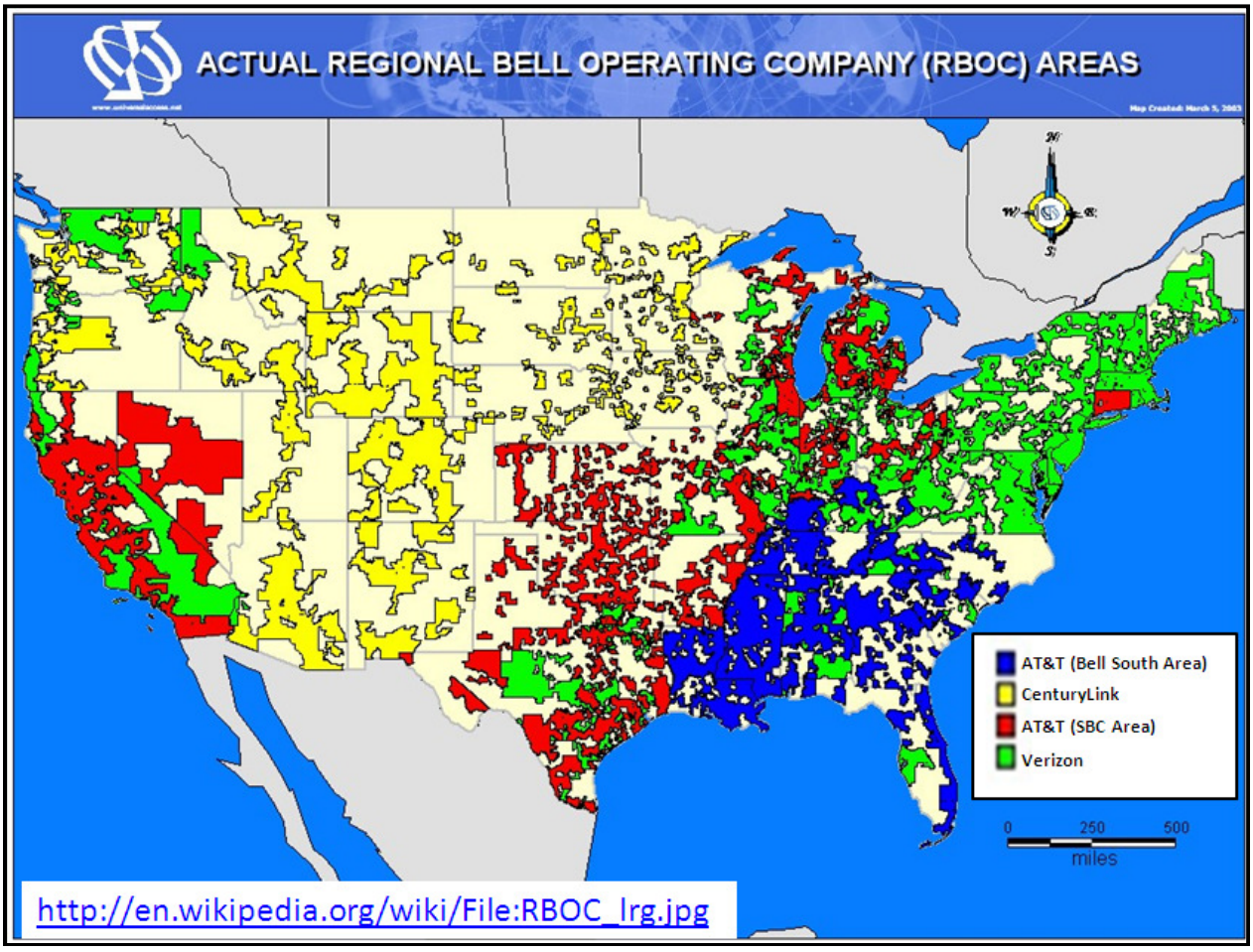
Sample Scope of Work Matrix				
Purpose:	Scope of work matrix with RACI designation for cell site backhaul			
Section	**Description**	**RACI Designation TBD**		
A	**Site Survey and Administrative**	**Company AAA**	**Company BBB**	**Company CCC**
Site Survey				
1A	Prior to completetion of construction drawings, perform joint site walk between all parties to establish specific conditions for backhaul instalation			
2A	Coordinate access into the cell site leased area for any reason			
Project Management Services				
3A	Include in any applicable construction documentation, the conduit routes, cabinet locations and any other associated backhaul infrastructure.			
4A	Update schedule & provide closeout package			
5A	Manage subcontractors			
B	**Construction**			
Telecommunications Cable Conduit				
1B	Construct conduit(s) from A to B			
2B	Construction conduit(s) from B to C			
Telecommunications Cable/Fiber				
3B	Pull telecommunications cable from A to B			
4B	Pull telecommunications cable from B to C			
5B	Engineer, furnish and install all equipment			
6B	Extend space and power for new equipment			
7B	Engineer, furnish and install all equipment			
DC Power				
8B	Install power for new equipment			
9B	Install conduit for power runs			
C	**Site Acquisition Services**			
1C	Lease review			
2C	Conduct structural analysis			
3C	Perform site acquisition services			
4C	Obtain any regulatory approvals			
5C	Submit all applications and pay associated fees			

Cable MSO Coverage Map (Source: MediaBiz)



http://www.mediabiz.com/news/articles/?edit_id=15360

iLEC or RBOC Coverage Map (Source: Wikipedia)



Estimated Timeline of RFQ Process